



TFT LCD Tentative Specification

MODEL NO.: N141C6 - L03

Customer:

Approved by:

Note:

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**REVISION HISTORY**

Version	Date	Page (New)	Section	Description
0.0	Feb. 27,'09	All	All	Tentative specification was first issued.



1 GENERAL DESCRIPTION

1.1 OVERVIEW

N141C6 - L03 is a 14.1" TFT Liquid Crystal Display module with single LED Backlight unit and 40 pins LVDS interface. This module supports 1440 x (3 RGB) x 900 WXGA+ mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The converter module for backlight is built in.

1.2 FEATURES

- LED backlight
- WXGA+ (1440 x 900 pixels) resolution
- DE only mode
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 2 pixel/clock
- RoHS compliance

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	303.48(H) X 189.675(V) (14.1 inch Diagonal)	mm	(1)
Bezel Opening Area	306.76 (H) x 193 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 x R.G.B. x 900	pixel	-
Pixel Pitch	0.21075 (H) x 0.21075 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Hard coating (3H), Anti-glare type	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	319	319.5	320	mm	(1)
	Vertical(V)	205	205.5	206	mm	
	Depth(D)	--	5.2	5.5	mm	
Weight		--	420	435	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions



2 ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

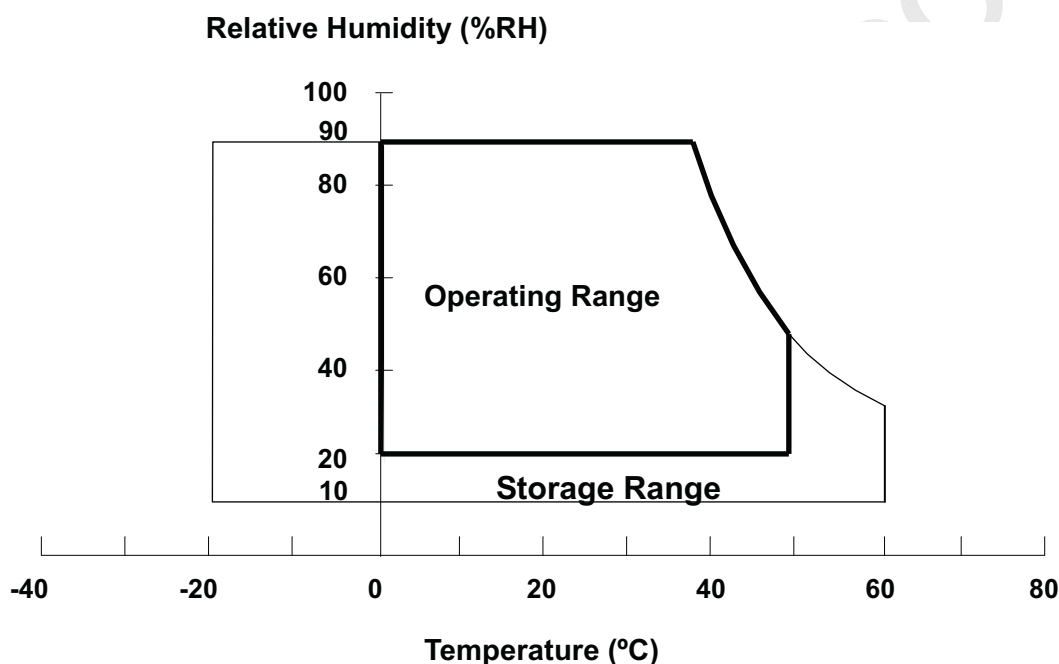
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(1), (2)
Shock (Non-Operating)	S _{NOP}	-	220/2	G/ms	(3), (5)
Vibration (Non-Operating)	V _{NOP}	-	1.5	G	(4), (5)

Note (1) (a) 90 %RH Max. (Ta ≤ 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 °C Min. and 60 °C Max..



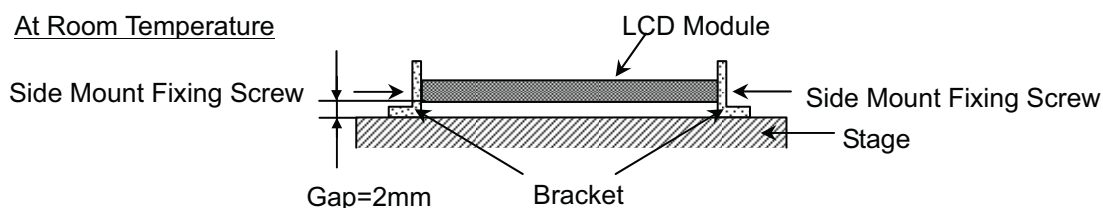
Note (3) 1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4) 10 ~ 500 Hz, 30 min / Cycle, 1 cycles for each X, Y, Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:

At Room Temperature





2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC}	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	$V_{CC}+0.3$	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
LED Light Bar Power Supply Voltage	V_L	-40	27.2	V	(1), (2)
LED Light Bar Power Supply Current	I_L	0	150	mA	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED (Refer to 3.2 for further information).



3 ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

 $T_a = 25 \pm 2^\circ\text{C}$

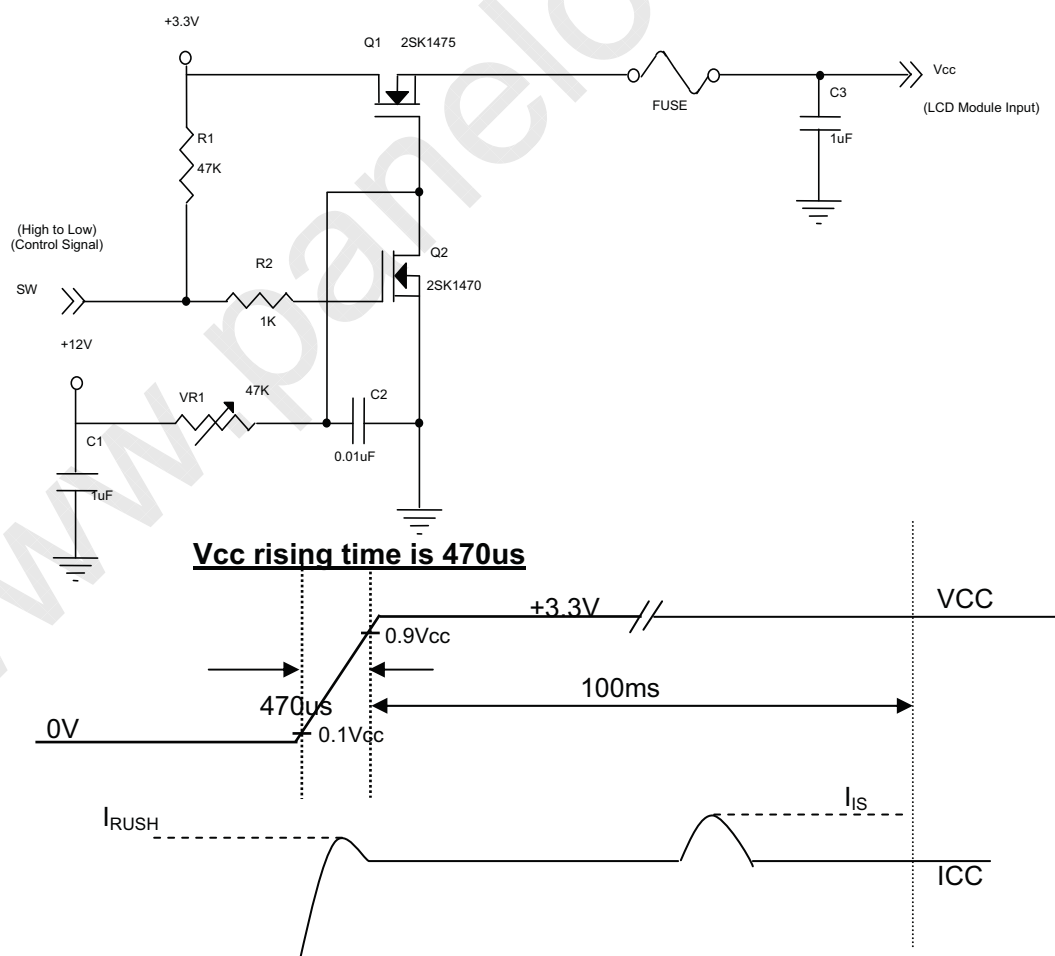
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	-
Permissible Ripple Voltage	V _{RP}		50		mV	-
Rush Current	I _{RUSH}			1.5	A	(2)
Initial Stage Current	I _{IS}			1.0	A	(2)
Power Supply Current	White		(370)		mA	(3)a
	Black		(480)		mA	(3)b
LVDS Differential Input High Threshold	V _{TH(LVDS)}			+100	mV	(5), V _{CM} =1.2V
LVDS Differential Input Low Threshold	V _{TL(LVDS)}	-100			mV	(5), V _{CM} =1.2V
LVDS Common Mode Voltage	V _{CM}	1.125		1.375	V	(5)
LVDS Differential Input Voltage	V _{ID}	100		600	mV	(5)
Terminating Resistor	R _T		100		Ohm	
Power per EBL WG	P _{EBL}	-	TBD	-	W	(4)

Note (1) The ambient temperature is $T_a = 22 \pm 2^\circ\text{C}$.

Note (2) I_{RUSH}: the maximum current when V_{CC} is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black





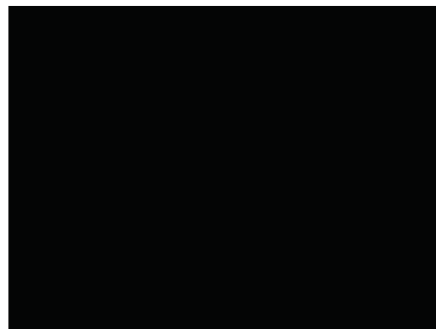
Note (3) The specified power supply current is under the conditions at $V_{CC} = 3.3\text{ V}$, $T_a = 22 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern



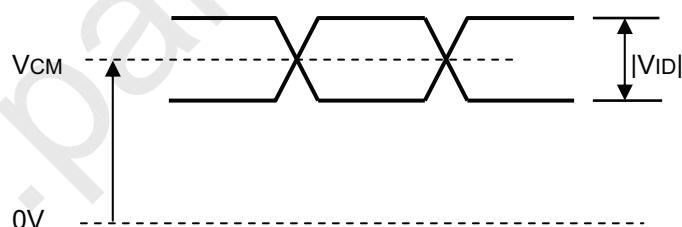
Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the converter input power. Test conditions are as follows.

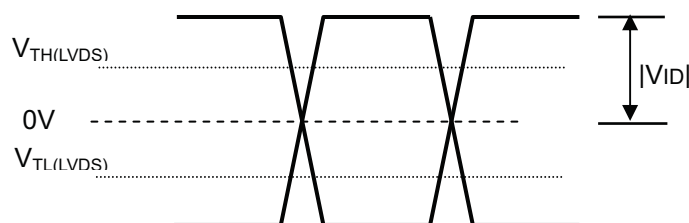
- (a) $V_{CC} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 60\text{ Hz}$,
- (b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.
- (c) Luminance: 60 nits.

Note (5) The parameters of LVDS signals are defined as the following figures.

Single Ended



Differential



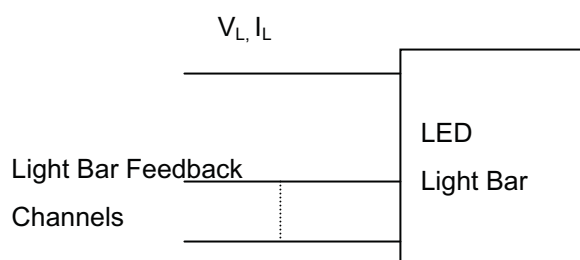


3.2 BACKLIGHT UNIT

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED light bar Power Supply Voltage	V _L	24	25.6	27.2	V _{dc}	(1), (2)
LED light bar Power Supply Current	I _L	114	120	126	mA	
LED Life Time	L _{BL}	15,000	-	-	Hrs	(4)
Power Consumption	P _L	2.736	3.072	3.427	W	(3), I _L = 120.0 mA

Note (1) LED light bar configuration is shown as below:



Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

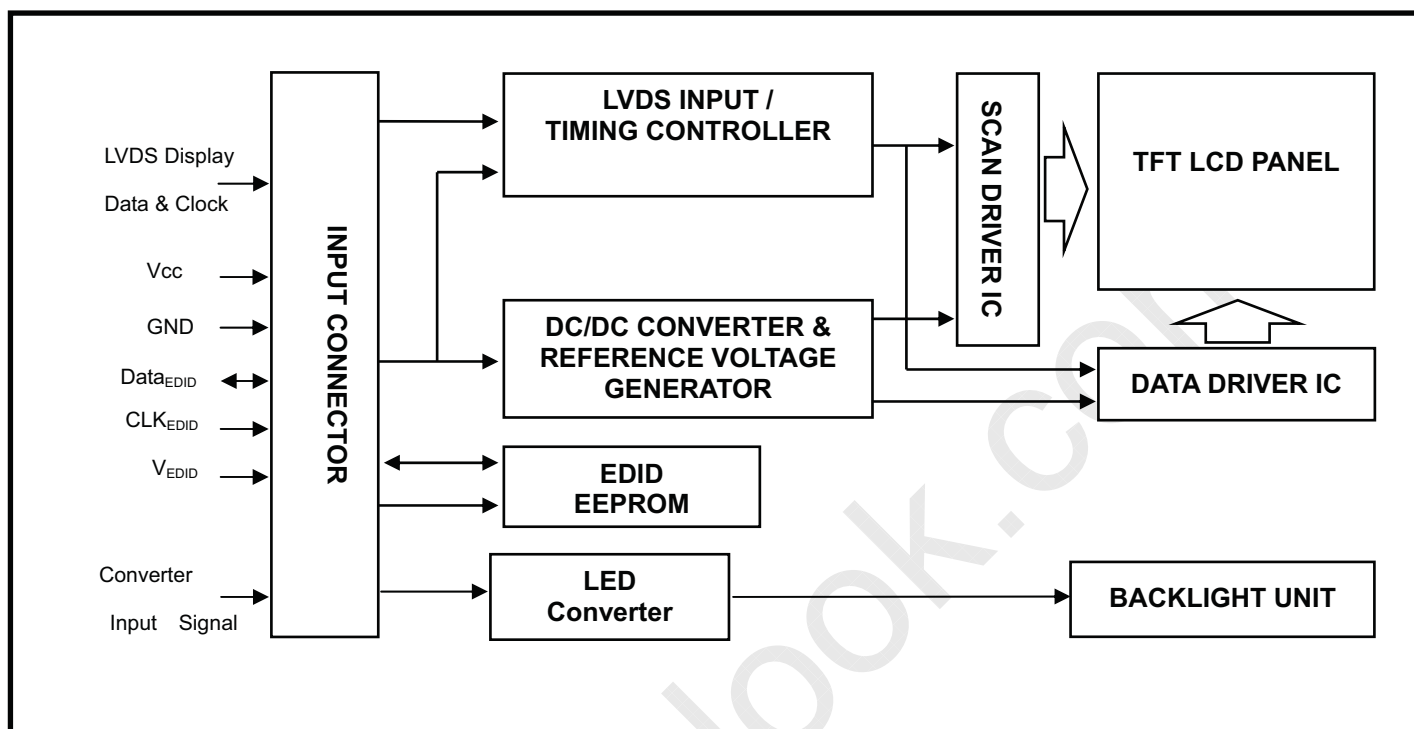
Note (3) $P_L = I_L \times V_L$

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 22 ± 2 °C and IL = 20.0 mA(Per EA) until the brightness becomes ≤ 50% of its original value.



4 BLOCK DIAGRAM

4.1 TFT LCD MODULE





5 INPUT TERMINAL PIN ASSIGNMENT

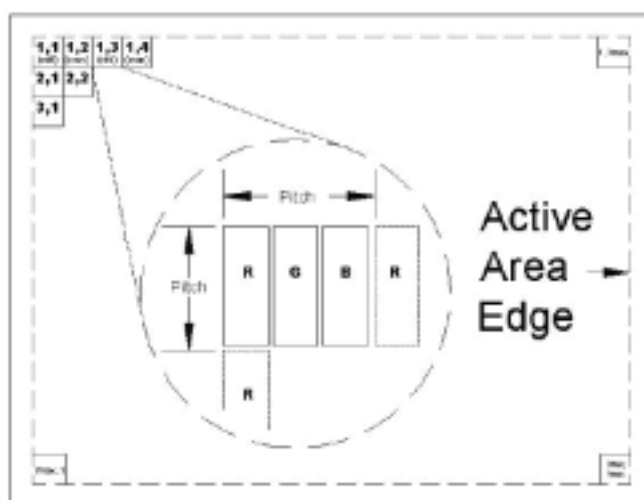
5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	VSS	Ground		
2	VDD	Power Supply (3.3V typ.)		
3	VDD	Power Supply (3.3V typ.)		
4	V _{EDID}	DDC 3.3V Power		
5	NC	No Connection (Reserved for CMO test)		
6	CLK _{EDID}	DDC Clock		
7	DATA _{EDID}	DDC Data		
8	RXO0-	- LVDS differential data input (Odd)	Negative	R0-R5, G0
9	RXO0+	+ LVDS differential data input (Odd)	Positive	
10	VSS	Ground		
11	RinO1-	- LVDS differential data input (Odd)	Negative	G1-G5, B0-B1
12	RinO1+	+ LVDS differential data input (Odd)	Positive	
13	VSS	Ground		
14	RinO2-	- LVDS differential data input (Odd)	Negative	B2-B5, HS, VS, DE
15	RinO2+	+ LVDS differential data input (Odd)	Positive	
16	VSS	Ground		
17	RXOC-	- LVDS differential clock input (Odd)	Negative	
18	RXOC+	+ LVDS differential clock input (Odd)	Positive	
19	VSS	Ground		
20	RinE0-	- LVDS differential data input (Even)	Negative	R0-R5, G0
21	RinE0+	+ LVDS differential data input (Even)	Positive	
22	VSS	Ground		
23	RinE1-	- LVDS differential data input (Even)	Negative	G1-G5, B0-B1
24	RinE1+	+ LVDS differential data input (Even)	Positive	
25	VSS	Ground		
26	RinE2-	- LVDS differential data input (Even)	Negative	B2-B5, HS, VS, DE
27	RinE2+	+ LVDS differential data input (Even)	Positive	
28	VSS	Ground		
29	RXEC-	- LVDS differential clock input (Even)	Negative	
30	RXEC+	+ LVDS differential clock input (Even)	Positive	
31	LED_GND	LED Ground		
32	LED_GND	LED Ground		
33	LED_GND	LED Ground		
34	NC	No Connection (Reserve)		
35	LED_PWM	PWM Control Signal of LED Converter		
36	LED_EN	Enable Control Signal of LED Converter		
37	NC	No Connection (Reserve)		
38	LED_VCCS	LED Power		
39	LED_VCCS	LED Power		
40	LED_VCCS	LED Power		

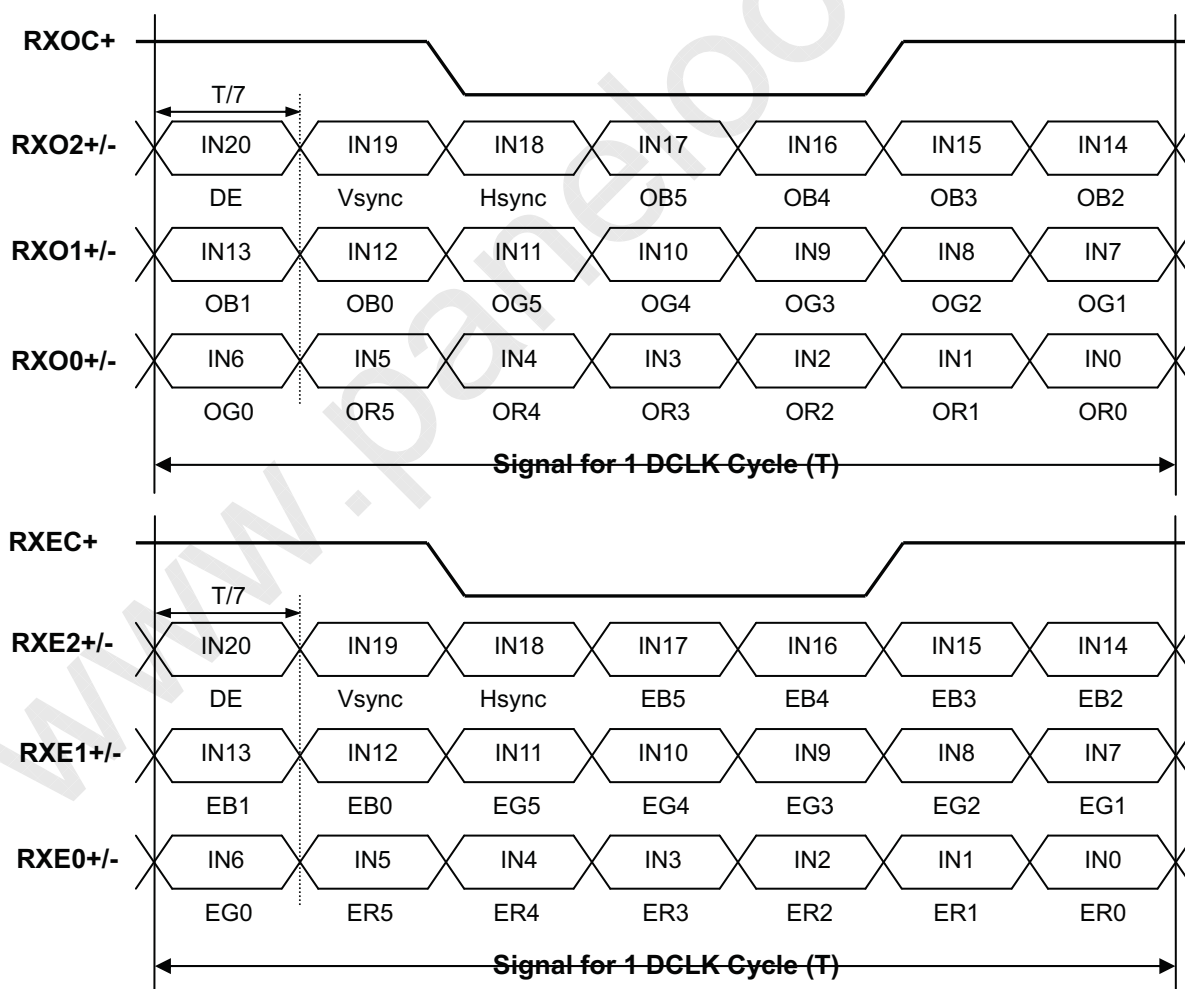
Note (1) Connector Part No. : I-PEX 20455-040E-12 or equivalent

Note (2) User's connector Part No : I-PEX 20453-040T-12 or equivalent

Note (3) The first pixel is odd as shown in the following figure.



5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL





5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	

Note (1) 0: Low Level Voltage, 1: High Level Voltage



5.4 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPD1 standards.

Byte # (decimal)	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header , Fixed	00	00000000
1	1	Header , Fixed	FF	11111111
2	2	Header , Fixed	FF	11111111
3	3	Header , Fixed	FF	11111111
4	4	Header , Fixed	FF	11111111
5	5	Header , Fixed	FF	11111111
6	6	Header , Fixed	FF	11111111
7	7	Header , Fixed	00	00000000
8	8	ID system manufacturer name	30	00110000
9	9	ID system manufacturer name	AE	10101110
10	0A	ID system Product Code (LSB)	36	00110110
11	0B	ID system Product Code (MSB)	40	01000000
12	0C	32-bit serial # Unused(01h for VESA, 00h for SPWG)	00	00000000
13	0D	32-bit serial # Unused(01h for VESA, 00h for SPWG)	00	00000000
14	0E	32-bit serial # Unused(01h for VESA, 00h for SPWG)	00	00000000
15	0F	32-bit serial # Unused(01h for VESA, 00h for SPWG)	00	00000000
16	10	Week of manufacture 1 - 53 (unused: 00h) : 10h fixed by CMO	10	00010000
17	11	Year of manufacture year - 1990(unsed:00h) : 13h (Year 2009) fixed by CMO	13	00010011
18	12	Version=1	01	00000001
19	13	Revision=3	03	00000011
20	14	Digital	80	10000000
21	15	Active area horizontal 303.36cm	1E	00011110
22	16	Active area vertical 189.6cm	13	00010011
23	17	gamma * 100-100 = 2.2*100-100=120	78	01111000
24	18	Feature support (no DPMS, Active off, RGB, Preferred Timing Mode)	EA	11101010
25	19	Rx1 Rx0 Ry1 Ry0 Gx1 Gx0 Gy1 Gy0	93	10010011
26	1A	Bx1 Bx0 By1 By0 Wx1 Wx0 Wy1 Wy0	65	01100101
27	1B	Rx=0.58	94	10010100
28	1C	Ry=0.349	59	01011001
29	1D	Gx=0.336	56	01010110
30	1E	Gy=0.569	91	10010001
31	1F	Bx=0.157	28	00101000
32	20	By=0.135	22	00100010
33	21	Wx=0.313	50	01010000
34	22	Wy=0.329	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2 (1440x900@60Hz)	00	00000000
37	25	No manufacturer's specific timing	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001



42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock ("97.78MHz", According to VESA CVT Rev1.1)	32	00110010
55	37	97.78MHz/10000 =9778=2632(Hex)	26	00100110
56	38	HActive(D7-D0) = 1440 mod 256	A0	10100000
57	39	HBlank(D7-D0) = 320 mod 256	40	01000000
58	3A	HActive(D11-D8) : HBlank(D11-D8) = 1440/256 : 320/256	51	01010001
59	3B	VActive(D7-D0) =900 mod 256	84	10000100
60	3C	VBlank(D7-D0) = 26 mod 256	1A	00011010
61	3D	VActive(D11-D8) : VBlank(D11-D8) = 900/256 : 26/256	30	00110000
62	3E	HSyncOffset(D7-D0) = HBorder+HFrontPorch = 48	30	00110000
63	3F	HSyncWidth(D7-D0) = 32	20	00100000
64	40	VSynOffset(D3-D0)=3 : VSynWidth(D3-D0)=6	36	00110110
65	41	HSyncOffset(D9-D8) : HSyncWidth(D9-D8) : VSynOffset(D5-D4) : VSynWidth(D5-D4)	00	00000000
66	42	HImageSize(mm, D7-D0) = 303mod 256	2F	00101111
67	43	VImageSize(mm, D7-D0) = 190mod 256	BE	10111110
68	44	HImageSize(D11-D8) : VImageSize(D11-D8) = 303/256 : 190/256	10	00010000
69	45	Horizontal Border=0	00	00000000
70	46	Vertical Border=0	00	00000000
71	47	Non-interlaced, Normal Display, Digital separate, Positive Hsync, Negative Vsync	18	00011000
72	48	Detailed timing description # 1 Pixel clock ("81.48MHz", According to VESA CVT Rev1.1)	D4	11010100
73	49	81.48MHz/10000 =8148=1FD4(Hex)	1F	00011111
74	4A	HActive(D7-D0) = 1440 mod 256	A0	10100000
75	4B	HBlank(D7-D0) = 320 mod 256	40	01000000
76	4C	HActive(D11-D8) : HBlank(D11-D8) = 1440/256 : 320/256	51	01010001
77	4D	VActive(D7-D0) =900 mod 256	84	10000100
78	4E	VBlank(D7-D0) = 26 mod 256	1A	00011010
79	4F	VActive(D11-D8) : VBlank(D11-D8) = 900/256 : 26/256	30	00110000
80	50	HSyncOffset(D7-D0) = HBorder+HFrontPorch = 48	30	00110000
81	51	HSyncWidth(D7-D0) = 32	20	00100000
82	52	VSynOffset(D3-D0)=3 : VSynWidth(D3-D0)=6	36	00110110
83	53	HSyncOffset(D9-D8) : HSyncWidth(D9-D8) : VSynOffset(D5-D4) : VSynWidth(D5-D4)	00	00000000
84	54	HImageSize(mm, D7-D0) = 303mod 256	2F	00101111
85	55	VImageSize(mm, D7-D0) = 190mod 256	BE	10111110



86	56	HImageSize(D11-D8) : VImageSize(D11-D8) = 303/256 : 190/256	10	00010000
87	57	Horizontal Border=0	00	00000000
88	58	Vertical Border=0	00	00000000
89	59	Non-interlaced, Normal Display, Digital separate, Positive Hsync, Negative Vsync	18	00011000
90	5A	Flag	00	00000000
91	5B	Flag	00	00000000
92	5C	Flag	00	00000000
93	5D	Data type tag :0F	0F	00001111
94	5E	Flag	00	00000000
95	5F	Low Refresh Rate #1 (Horizontal active pixels / 8) - 31=149(95h)	95	10010101
96	60	Low Refresh Rate #1 Image Aspect ratio(16 : 10)	0A	00001010
97	61	Low Refresh Rate #1 Refresh Rate=50Hz	32	00110010
98	62	Low Refresh Rate #2 (Horizontal active pixels / 8) - 31=149(95h)	95	10010101
99	63	Low Refresh Rate #2 Image Aspect ratio(16 : 10)	0A	00001010
100	64	Low Refresh Rate #2 Refresh Rate=40Hz	28	00101000
101	65	Brightness (1/10nit) , 220/10=22(=16h)	16	00010110
102	66	Feature Flags	09	00001001
103	67	Reserved	00	00000000
104	68	EISA manufacturer code(3 Character ID) -CMO	0D	00001101
105	69	Compressed ASCII	AF	10101111
106	6A	Panel Supplier Reserved - Product code -1454	54	01010100
107	6B	(Hex, LSB first)	14	00010100
108	6C	Flag	00	00000000
109	6D	Flag	00	00000000
110	6E	Flag	00	00000000
111	6F	Data type tag : FEh	FE	11111110
112	70	Flag	00	00000000
113	71	"N"	4E	01001110
114	72	"1"	31	00110001
115	73	"4"	34	00110100
116	74	"1"	31	00110001
117	75	"C"	43	01000011
118	76	"6"	36	00110110
119	77	"-"	2D	00101101
120	78	"L"	4C	01001100
121	79	"0"	30	00110000
122	7A	"3"	33	00110011
123	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
124	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
125	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
126	7E	No extension	00	00000000
127	7F	One-byte checksum of entire 128 bytes EDID equals 00h.	C4	11000100

6. CONVERTER SPECIFICATION

6.1 ABSOLUTE MAXIMUM RATINGS

Symbol	Ratings
LED_VCCS	6~40 V
LED_PWM, LED_EN	-0.3V~5.0V

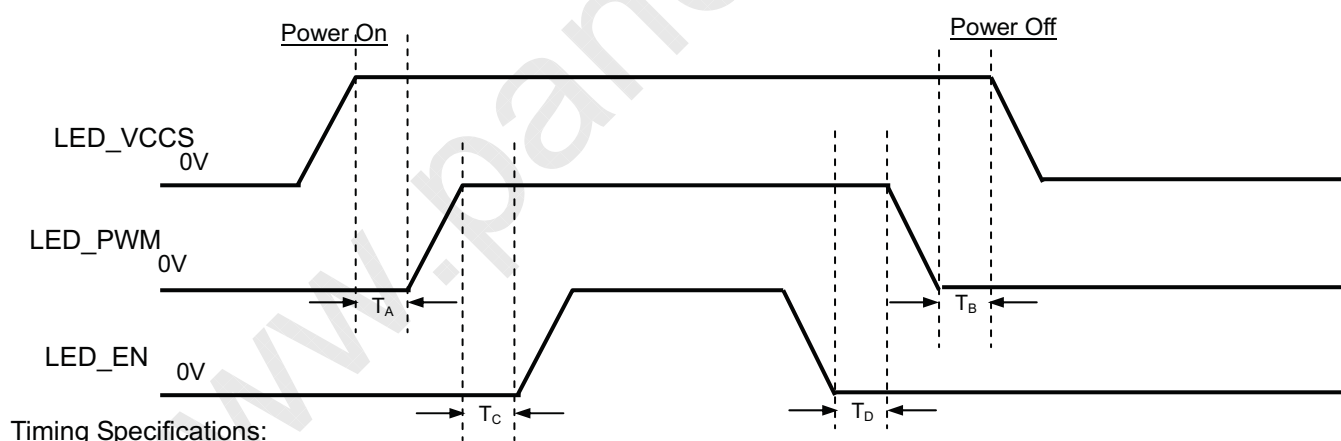
6.2 RECOMMENDED OPERATING RATINGS

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_Vccs	7.0	12.0	21.0	V	
EN Control Level	Backlight On		1.6	---	5.0	V	
	Backlight Off		0	---	0.8	V	
PWM Control Level	PWM High Level		1.3	---	5.0	V	
	PWM Low Level		0	---	0.15	V	
PWM Control Duty Ratio			(2)		(100)	%	
PWM Control Permissible Ripple Voltage		VPWM_pp			100	mV	
PWM Control Frequency		f _{PWM}	(100)	(210)	(500)	Hz	
Converter Input Current	LED_VCCS=Min	I _{BL}	(434)	(516)	(612)	mA	(1)
	LED_VCCS=Typ		(253)	(301)	(357)	mA	(1)
	LED_VCCS=Max		(145)	(172)	(204)	mA	(1)

Note (1) The specified LED power supply current is under the conditions at "LED_VCCS = Min/Typ/Max",

T_a = 25 ± 2 °C, f_{PWM} = 100 Hz, Duty=100%.

6.3 LED BACKLIGHT CONTROLL POWER SEQUENCE



Timing Specifications:

$$T_A \geq (0\text{ms})$$

$$T_B \geq (0\text{ms})$$

$$T_C \geq (0\text{ms})$$

$$T_D \geq (0\text{ms})$$

Note (1) Please follow the LED backlight power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller



7 INTERFACE TIMING

7.1 INPUT SIGNAL TIMING SPECIFICATIONS

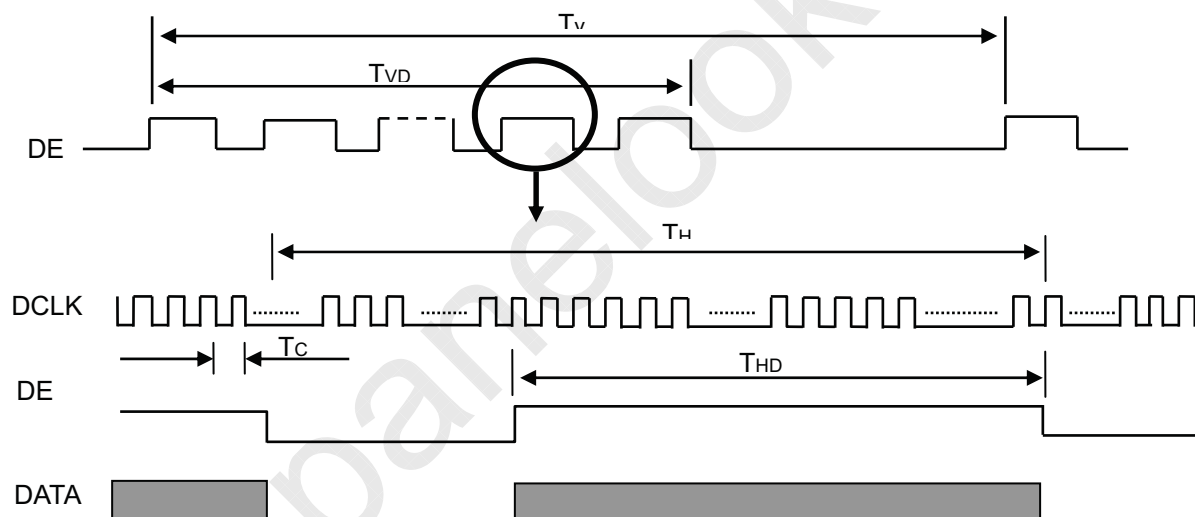
The specifications of input signal timing are as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	44	48.89	51.29	MHz	(2)
DE	Vertical Total Time	TV	922	926	952	TH	-
	Vertical Active Display Period	TVD	900	900	900	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	26	TV-TVD	TH	
	Horizontal Total Time	TH	796	880	898	Tc	(2)
	Horizontal Active Display Period	THD	720	720	720	Tc	(2)
	Horizontal Active Blanking Period	THB	TH-THD	160	TH-THD	Tc	(2)

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.

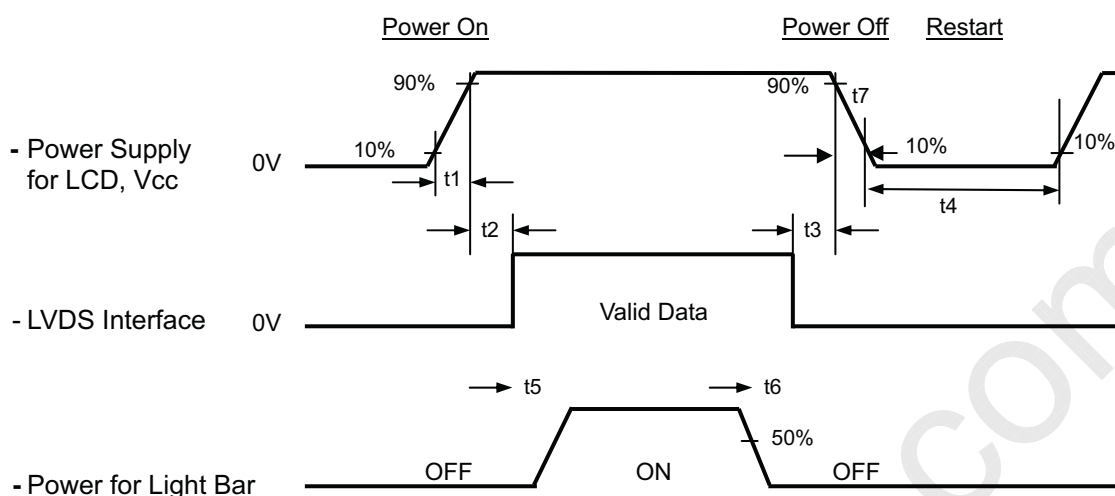
(2) 2 channels LVDS input.

INPUT SIGNAL TIMING DIAGRAM





7.2 POWER ON/OFF SEQUENCE



Timing Specifications:

$$0.5 < t_1 \leq 10 \text{ msec}$$

$$0 < t_2 \leq 50 \text{ msec}$$

$$0 < t_3 \leq 50 \text{ msec}$$

$$t_4 \geq 500 \text{ msec}$$

$$t_5 \geq 200 \text{ msec}$$

$$t_6 \geq 200 \text{ msec}$$

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow $(50\mu\text{s}) \leq t_7 \leq 300 \text{ ms}$.



8 OPTICAL CHARACTERISTICS

8.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	22±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I _L	(102)	mA

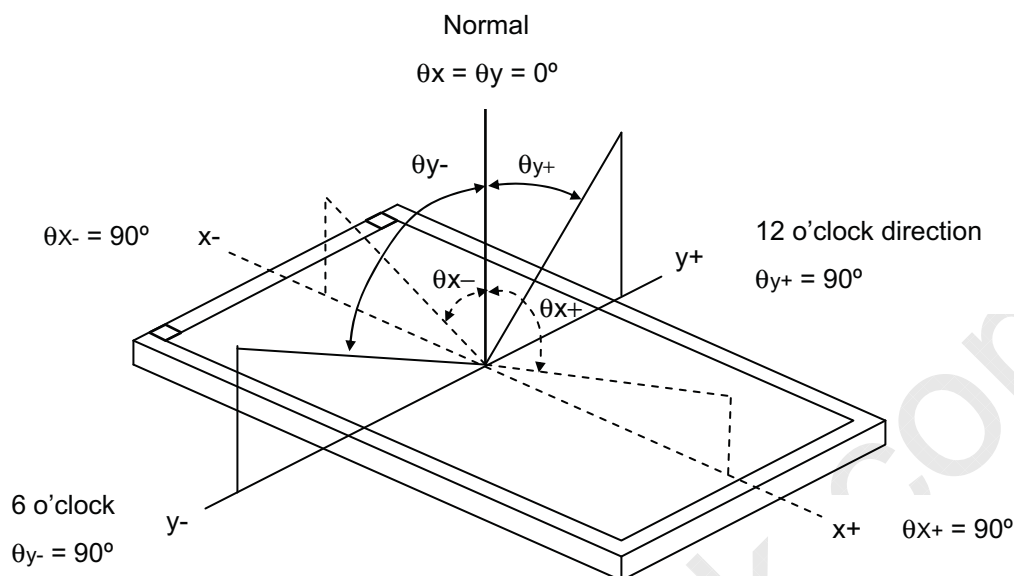
The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

8.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	400	500	-	-	(2), (6)
Response Time		T _R		-	5	10	ms	(3)
		T _F		-	11	16	ms	
Average Luminance of White		L _{AVE}		190	220	-	cd/m ²	(4), (6)
White Variation		δW5p		80	-	-	%	(5),(6)
		δW13p		60	-	-	%	
Color Chromaticity	Red	R _x		Typ. -0.03	TBD	Typ. +0.03	-	(1), (6)
		R _y			TBD		-	
	Green	G _x			TBD		-	
		G _y			TBD		-	
	Blue	B _x			TBD		-	
		B _y			TBD		-	
	White	W _x			0.313		-	
		W _y			0.329		-	
Viewing Angle	Horizontal	θ _x ⁺	CR≥10	40	45	-	Deg.	
		θ _x ⁻		40	45	-		
	Vertical	θ _y ⁺		15	20	-		
		θ _y ⁻		40	45	-		



Note (1) Definition of Viewing Angle (θ_x , θ_y):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

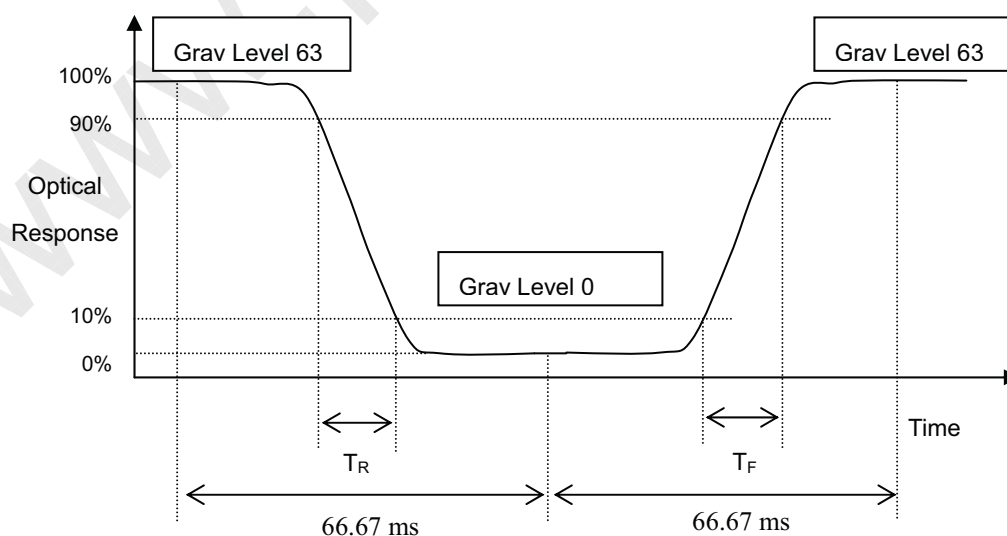
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (3) Definition of Response Time (T_R , T_F):





Note (4) Definition of Average Luminance of White (L_{AVE}):

Measure the luminance of gray level 63 at 5 points

$$L_{AVE} = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$$

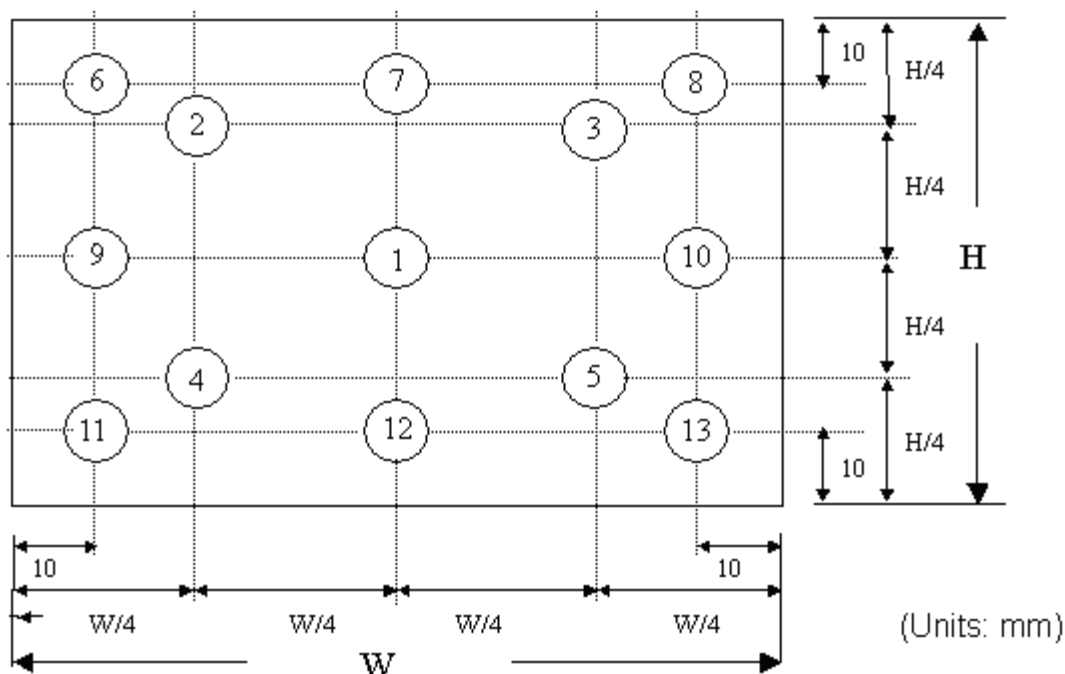
$L(x)$ is corresponding to the luminance of the point X at Figure in Note (5)

Note (5) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 & 13 points

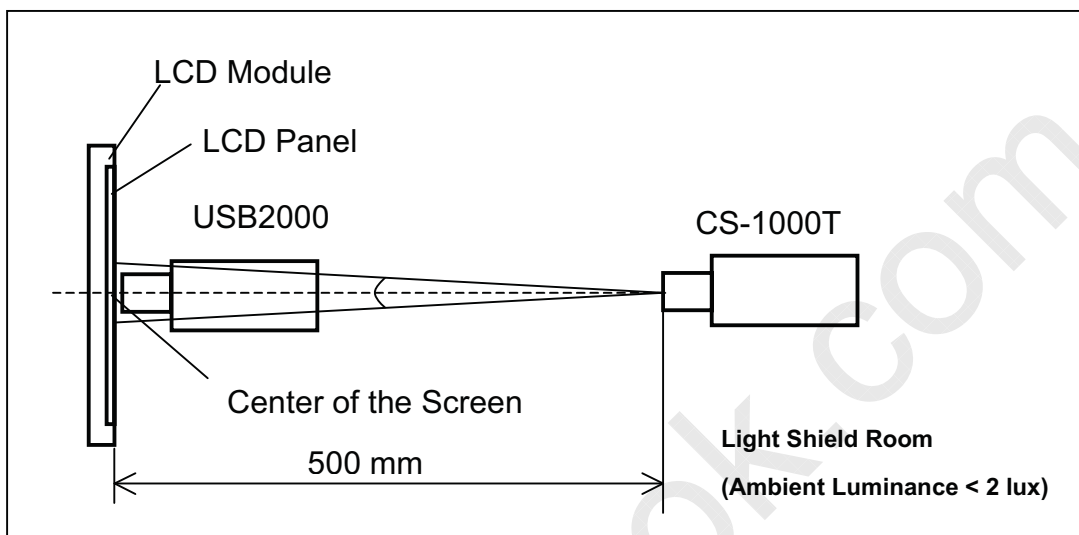
$$\delta W (5pt) = \text{Minimum } [L(1), L(2), L(3), L(4), L(5)] / \text{Maximum } [L(1), L(2), L(3), L(4), L(5)]$$

$$\delta W (13pt) = \text{Minimum } [L(1), L(2), L(3), L(4), L(5), L(6), L(7), L(8), L(9), L(10), L(11), L(12), L(13)] / \text{Maximum } [L(1), L(2), L(3), L(4), L(5), L(6), L(7), L(8), L(9), L(10), L(11), L(12), L(13)]$$



**Note (6) Measurement Setup:**

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.





9 PRECAUTIONS

9.1 HANDLING PRECAUTIONS

- (1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- (2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the module. Do not pull or fold the lamp wire.
- (10) Pins of I/F connector should not be touched directly with bare hands.

9.2 STORAGE PRECAUTIONS

- (1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- (3) It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

9.3 OPERATION PRECAUTIONS

- (1) Do not pull the I/F connector in or out while the module is operating.
- (2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.
- (3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.

9.4 OTHER PRECAUTIONS

- (1) When fixed patterns are displayed for a long time, remnant image is likely to occur.

10 PACKAGING

10.1 CARTON

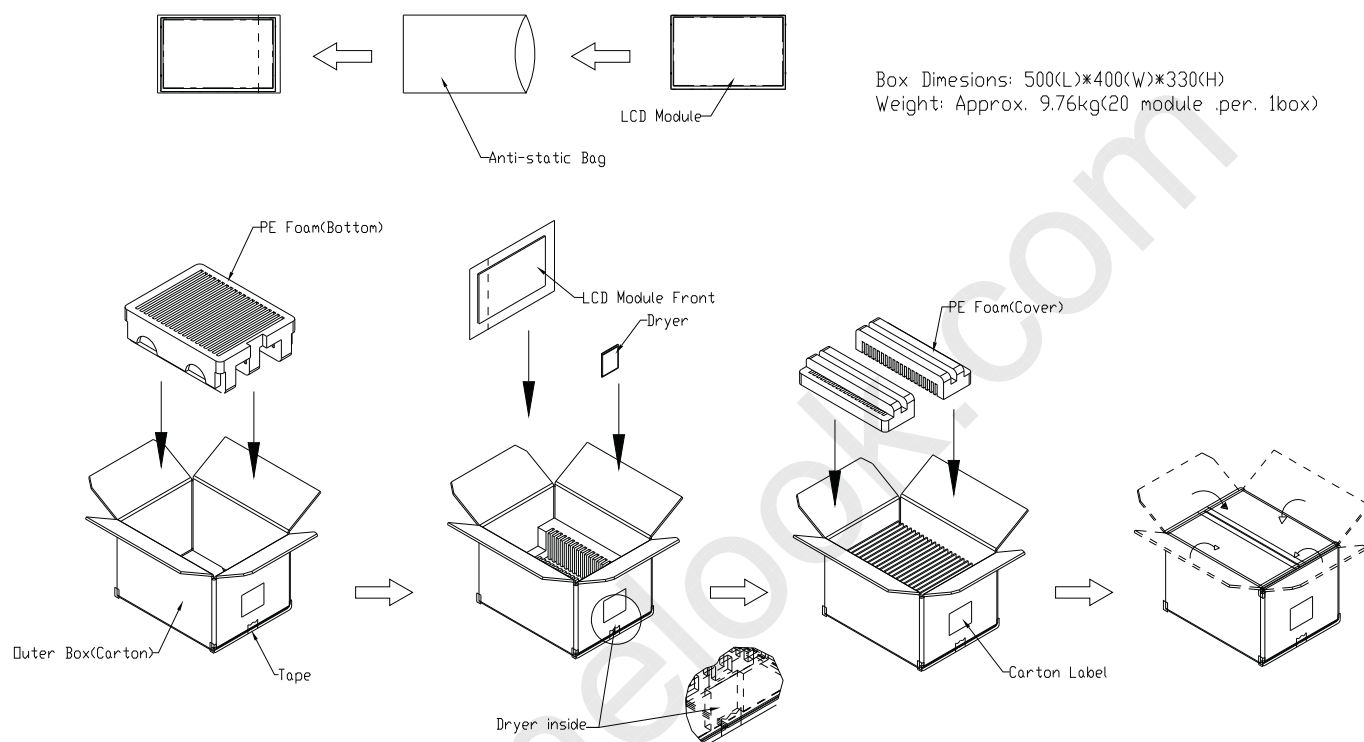


Figure. 10-1 Packing method



10.2 PALLET

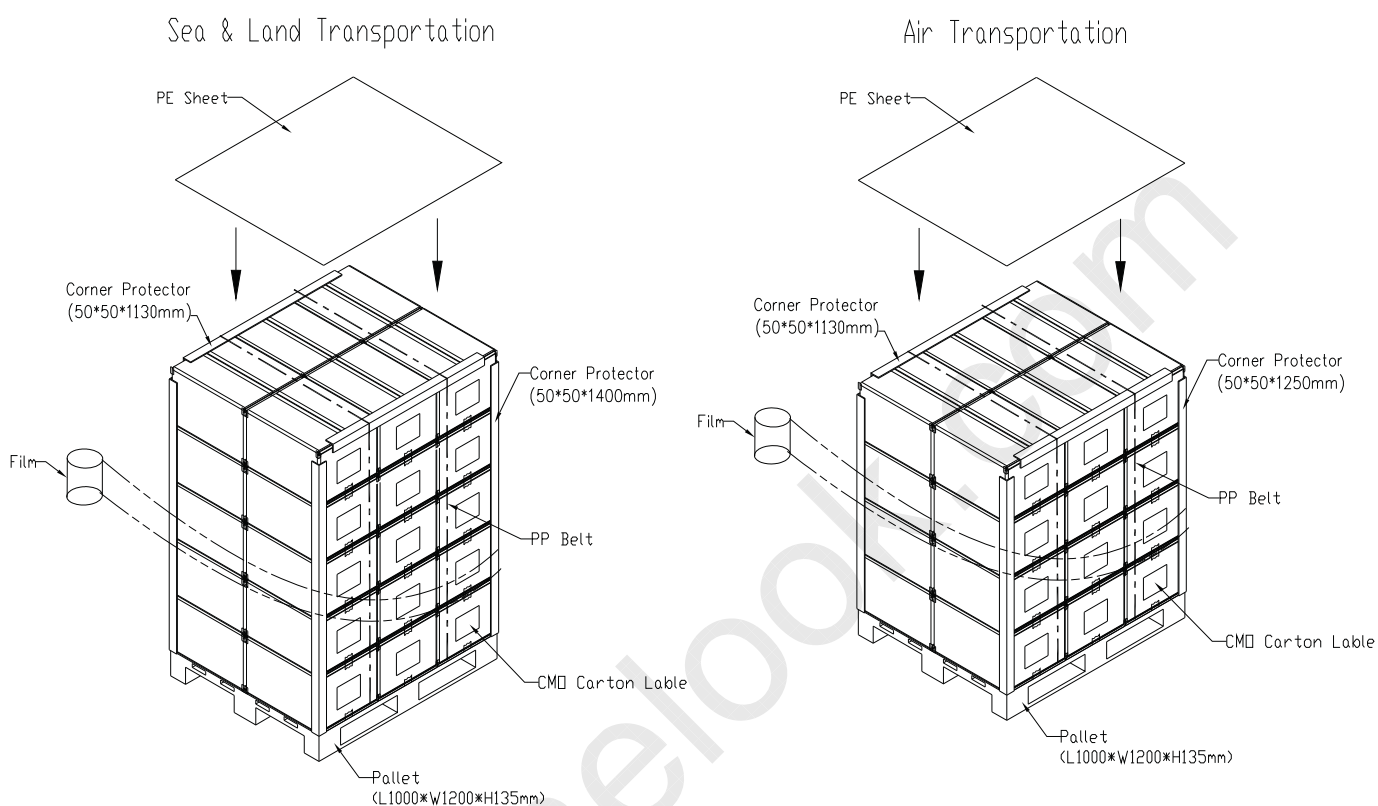


Figure. 10-2 Packing method



11 DEFINITION OF LABELS

11.1 CMO MODULE LABEL

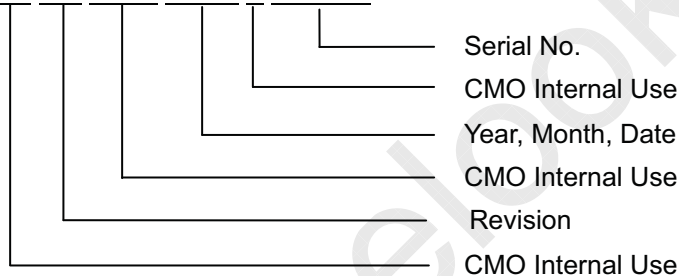
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: N141C6 - L03

(b) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.

(c) Serial ID: X X X X X X Y M D X N N N N



(d) Production Location: MADE IN China.

(e) LEOO: UL compliance remarks for CMO NingBo site production. It won't be available when production location isn't CMO NingBo.

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

For barcode content

11S PPPPPP Z1Z HHH SSSSSS YMM

(a) 11S: Fixed characters.

(b) PPPPPP (P/N): Customer part number 42T0722, fixed characters

(c) Z1Z: Fixed characters.

(d) HHH (Header Code): FY4

(e) SSSSSS: Series number.

(f) YMM: Y: The last character of year. MM: Month



11.2 CMO CARTON LABEL

The image shows a template for a CMO (Carton Marking Operation) label. It features a blue header with the CHI MEI logo and company name. Below the header, there are fields for PO.NO., Part ID., Model Name, and Carton ID. A barcode is positioned below the Carton ID field. To the right of the barcode, there is a field for Quantities. Below the barcode, it says "Lead Free" and "Made in XXXXX". On the right side, there is a yellow circle with "GP" inside and "RoHS" below it. The label is watermarked with "www.panelook.com".

(a) Production location: Made In XXXX. XXXX stands for production location.

